DOCUMENT RESUME

ED 123 691 CS 501 402

AUTHOR Eckloff, Maurine C.; Petelle, John
TITLE Cognitive Abstractness, Interpersonal Perception, Factual and Social Problem Solving.
PUB DATE 76
NOTE 40p.; Paper presented at the Annual Meeting of the International Communication Association (Portland, Oregon, April 1976)

EDRS PRICE MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS *Abstraction Levels; Behavioral Science Research; *Cognitive Processes; Decision Making; Group Behavior; Group Dynamics; Higher Education; Interaction Process Analysis; *Interpersonal Relationship; *Perception; *Problem Solving; Social Problems; Social Psychology

ABSTRACT

The purpose of this study was to investigate the effects of cognitive abstractness levels, interpersonal perception abilities, and task type (factual or social problem solving) on group performance as measured by time consumed and adequacy of solutions. Eighteen college classes from Kearney State College participated in testing of perceptual organization and social insight. Experimental groups of five were then assigned to one factual and one social problem solving task. Results indicate that groups high in cognitive abstractness and interpersonal perception appear to perform in a more adequate manner in both factual and social problem solving; those groups high in cognitive abstractness alone perform better in factual problem solving situations. Conversely, groups high in interpersonal perception alone exhibit better performance in social problem solving. Implications for real world task group formation can be extrapolated from the conclusions drawn by this study. (KS)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED123691

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

COGNITIVE ABSTRACTNESS, INTERPERSONAL PERCEPTION, FACTUAL AND SOCIAL PROBLEM SOLVING

by

Maurine C. Eckloff, Ph. D.
Associate Professor of Speech Communication
Kearney State College
Kearney, Nebraska 68847
Telephone: (308) 236-4078

"PERMISSION TO REPRODUCE THIS COPYRIGHTED MATERIAL HAS BEEN GRANTED BY

Maurine C. Eckloff
John Petelle

TO ERIC AND ORGANIZATIONS OPERATING UNDER AGREEMENTS WITH THE NATIONAL INSTITUTE OF EDUCATION. FURTHER REPRODUCTION OUTSIDE THE ERIC SYSTEM REQUIRES PERMISSION OF THE COPYRIGHT OWNER."

and

John Petelle, Ph. D.
Professor of Speech Communication
University of Nebraska
Lincoln, Nebraska 68588
Telephone: (402) 472-2070

CS 501 402

COGNITIVE ABSTRACTNESS, INTERPERSONAL PERCEPTION,

FACTUAL AND SOCIAL PROBLEM SOLVING

Researchers indicate that for optimal individual or group functioning, the individual or the group must fit the task. Lawrence Pervin (1965) in discussing individual environment fit, stated, "An environment must be suited to the species; if it isn't the organisms die or go elsewhere" (p. 59). Harris (1960) indicated the necessity of "goodness of fit" in selecting and placing engineers in positions requiring the production of new and original ideas for the solution of problems.

If groups must be fitted to tasks, it appears the best procedure to follow is to learn of groups through a knowledge of individuals in the groups. A number of studies (Haythorn, 1953; Schutz, 1961; McGrath, 1962; Haythorn, Couch, Haefner, Langham and Carter, 1956; Tuckman, 1964) support the theory that there is a high degree of constancy between the characteristics of individuals and the characteristics of the groups in which such individuals are combined. Based upon such research it appears that group behavior seems to resemble the behavior of individuals in the group (Fisher, 1974).

The question toward which this study was directed is, "Is small group task performance affected by the matching of the level of cognitive abstractness and level of interpersonal perception of group members to the task type (factual or social problem solving)?"

Cognitive Abstractness

Abstracting is generally recognized as the ability to discriminate and cognitively integrate dimensions of stimuli and to generate alternate structures of interacting schemata. Concrete thinking is realistic and tangible; conversely, abstract thinking is ideational and intangible. Individuals abstract common from particular properties. With abstracting there is the ability to synthesize parts and to grasp a whole. The abstract approach would be generally theoretical, impersonal and detached.

Concrete and abstract thinking are not dichotomous functions of the intellectual process. They are on a conceptual continuum; and, they are part of the global intellectual process (Schroder, Driver, Streufert, 1967). Pavio (1971) stated:

> . . . models of symbolic representation evolve within the individual from the more concrete to the more abstract. That is, the developing individual becomes increasingly able to deal with abstract symbols, problems that require taking account or or integrating information about temporally and spatially remote objects and events (p. 18) . . . .

Researchers define abstractness as the level of integrative complexity. Schroder, Driver, and Streufert (1967), for example, described a cognitive system in terms of the number of dimensions available for "reading" a given stimulus or range of stimuli and the complexity of the rules for combining such dimensions in order to generate new perceptions and judgments. As the scheme for integrating the dimensions becomes more complex, the authors state that the system is said to be more abstract. Harvey, Hunt, and Schroder (1961) discussed integrative complexity as the rules or program available for integrating concepts or dimensions. They postulated a dimension of abstractness, with maximum concreteness

at one end to maximum abstractness at the other, with abstractness defined as the level of integrative complexity.

Abstracting and problem solving. There appear to be two major ways to solve problems: through stimulus-response associations and through hypothesis testing. These, however, cannot be thought of as entirely separable functions.

Bourne (1966) stated that ability in abstracting and the ability to solve conceptual problems seem to be related. He noted:

> Tests of intellectual functioning include measures of abstraction, such as the adequacy with which a person can pick out the common features of an array of objects and the capacity to deal with . . . verbal concepts, almost without exception (p. 89).

Bourne (1966) stated that one variable which may affect the performance of gradual and sudden learners differently is stimulus complexity. For those who approach a concept problem by testing hypotheses, speed of solving would be reduced by increasing the number of irrelevant dimensions of the stimuli because each dimension adds a certain number of hypotheses that may be tested. Those who solve problems by gradually acquiring S-R associations through experience may show no such effect because the number of associations between levels on the relevant dimension and response categories is unaffected by the number of irrelevant dimensions. It may be true that highly abstract subjects will spend more time in solving complex problems through hypothesis testing, and concrete subjects may solve problems with complex stimuli more rapidly through S-R relationships which ignore irrelevant stimuli.

Interpersonal Perception

There are several ways in which one can gain insight into the feelings and motives of others. Numerous researchers have worked with concepts such as role-taking and empathy. The study of empathy has followed two fairly distinct paths. One process is that of Dymond's (1949) cognitive role-taking approach in which one imaginatively takes the role of another to make predictions about another's thoughts, feelings, and actions. With this, neutrality is viewed as aiding accuracy. The other approach to understanding others is defined as a vicarious emotional response to the perceived emotional experiences of others.

Phillips (1966) emphasized that one of the most valuable traits a member of a discussion group can have is the ability to perceive the values of others. The ability to understand why someone may hold strongly to a contrary opinion helps in determining what might be necessary to bring about a consensus.

In this study, the approach to interpersonal perception stated by Chapin (1968) is used. He defined interpersonal perception as the perceptiveness and accuracy with which an individual can appraise others, sense what they feel and think, and predict what they may do or say. According to Chapin, the ability to evaluate an interpersonal situation also implies the ability to perceive what might be needed to bring about certain changes in any given situation, to improve it, perhaps, or to rectify disturbing tensions or conflicts.

Group Tasks

In recent years invetigators have become more interested in the task area of group research, and group tasks have been defined in varied ways. Hackman (1969) defines the group task as:

> The confronting of an actor with a designated stimulus situation in which he is required to follow stipulated rules of procedure in responding to the situation, and in which he must attempt to satisfy specified criteria by which the amount of success of his acts is judged (p. 97) . . . .

Task type. For many years, group theorists have recognized the importance of the task in the study of small group communication. In recent years, however, a number of theorists and researchers have introduced some order into the problem of task analysis. This order has been achieved through the development of task typologies. A task typology consists of a set of categories or classifications into which group tasks may be sorted. These typologies may be very simple or extremely complex.

For example, Roby and Lanzetta (1958) intuitively classified tasks with a task being selected for a group because it embodies those attributes which the investigator wishes to explore. Marvin Shaw (1963) classified tasks according to task dimensions, the major ones being difficulty, solution multiplicity, intrinsic interest, cooperation requirements, intellectual-manipulative requirements, population familiarity. On the other hand, Hackman (1968) used three task types: production, discussion, and problem solving, each requiring written verbal responses. Although various investigators have classified tasks in various ways, the three major types of Hackman's appear to be generally accepted.

Comparison between factual problem solving and social problem solving. The three major task types from Hackman may be classified further according to specific requirements. It appears that there are two major kinds of problem solving: factual and social. It seems that factual problem solving requires abstract mental processes, and social problem solving requires a type of social intelligence. Chapin (1939) states:

> Measures of abstract intelligence . . . have been developed and improved until now they provide reliable and valid tools which are a useful supplement to individual diagnosis in clinics, schools, and social agencies, for college entrance, and vocational guidance. Yet it is a commonplace of observation that persons capable of solving abstract mathematical equations are not always good companions and that successful salesmen may be unable to understand problems that require capacity for abstract thinking. Obviously something other than superior mental ability is involved in good social adjustments and in "the ability to get along with one's associates" (p. 157).

Katz (1963) noted:

> It goes without saying that the objective of problem-solving of a factual kind--and the . . . solving of psychological problems and the grasping of inner psychic reality--are not completely comparable. Understanding people is a specialized task in the general problem of comprehension and calls for more than the usual investment of self in the subject of the object being studied.

It seems that factual problem solving and social problem solving each make unique demands on the problem solver. Understanding others calls for more self-involvement, and tends to result in evaluative judgments. Understanding the physical, factual environment tends to result in generalizations of a more factual, less evaluative nature.

Group performance and abstract functioning of individual members. Tuckman (1964) investigated the relation between the level of cognitive abstractness of the members of groups composed homogeneously and the behaviors of such groups. Tuckman found that the level of abstractness or complexity of the group's performance is an increasing function of the level of abstractness of the individual members of the group.

Lawrence (1962) observed that more abstract individuals, when grouped together, produce more abstract teams. Likewise, Schroder, Driver and Streufert (1967) found that concrete groups fail to utilize all the information which they receive.

Schroder, Driver and Streufert (1967) predicted no difference in performance between simple and complex groups if both the environment and the criterion were simple and found that concrete information processing systems have relatively poor performance where the task is complex.

Jawa (1970) found that creative, abstract individuals are more task than interaction oriented. Groups composed of highly abstract individuals might be expected to be more task directed.

Performance and interpersonal perception. Libby (1971) found that accurate social perception is associated with being warm and close, rather than cool and distant. Groups composed of individuals high in interpersonal perception can be expected to interact more than groups composed of individuals low in interpersonal perception.

On the other hand, Josephson (1972) found more confusion in person oriented groups than in task oriented groups. Feidler (1965) in a similar way, stated:

> We find that a person who leads a task group should be a psychologically distant individual. Presumably, this type of attitude permits one to be more objective, which in turn prevents emotional involvement with one's subordinates and hence leads to better discipline and businesslike work relations. Other types of tasks such as heading a policy-making group apparently demand different attitudes on the part of the leader (p. 256) . . . .

Feidler continued:

> Interpersonal perception scores have thus been shown to be improtant predictors of external criteria. This, we feel is the first step toward establishing the theoretical importance of variables related to perception of persons (p. 256) . . . .

Purpose of the Study

The purpose of the present study was to investigate the effects of three independent variables: (1) cognitive abstractness levels of individual group members, (2) the interpersonal perception ability of individual group members, and (3) the task type (factual or social problem solving) on two dependent variables: (1) group performance measured by time consumed and (2) group performance measured by adequacy of solutions as judged by independent judges. An attempt was made to predict group performance on the basis of grouping of individual members on the basis of their measured cognitive abstractness level and interpersonal perception and assigning groups to two types of problem solving tasks, those dealing with factual issues and those dealing with social issues. The study investigates particular performances which are characteristic of groups of different compositions and addresses itself to the question of whether or not group performance is related to group composition.

Hypotheses

In an attempt to answer the questions advanced, and based on the review of literature, the following hypotheses were postulated and tested in this study for two dependent variables, time consumed and adequacy of solutions:

1. There will be a significant difference among the groups on abstractness when measuring time consumed.
2. There will be a significant difference among the groups on interpersonal perception when measuring time consumed.
3. There will be no significant difference among the groups on problem solving type when measuring time consumed.
4. There will be no significant abstractness factor x interpersonal perception factor interaction among groups when measuring time consumed.

5. There will be a significant abstractness factor x problem solving factor interaction among groups when measuring time consumed.

6. There will be a significant interpersonal perception factor x problem solving factor interaction among groups when measuring time consumed.

7. There will be no significant abstractness factor x interpersonal perception factor x problem solving interaction among groups when measuring time consumed.

8. There will be a significant difference among the groups on abstractness when measuring judged adequacy.

9. There will be a significant difference among the groups on interpersonal perception when measuring judged adequacy.

10. There will be no significant difference among the groups on problem solving when measuring judged adequacy.

11. There will be a significant abstractness factor x interpersonal perception factor interaction among groups when measuring judged adequacy.

12. There will be a significant abstractness factor x problem solving factor interaction among groups when measuring judged adequacy.

13. There will be a significant interpersonal perception factor x problem solving factor interaction among groups when measuring judged adequacy.

14. There will be no significant abstractness factor x interpersonal perception factor x problem solving interaction among groups when measuring judged adequacy.

Of major interest in this study were the product adequacy and time consumed of the following: low abstract, low interpersonal perception; low abstract, high interpersonal perception; high abstract, low interpersonal perception; high abstract, high interpersonal perception groups as they faced tasks dealing with factual or social issues.

Procedure

Measures Used

The Test of Perceptual Organization (also known as a "Test of Verbal Reasoning" and the "Abstract Reasoning Test") was used in this study as a measure of cognitive abstractness for blocking individuals into groups of high and low abstractness. It is designed to measure (1) abstract reasoning (2) the ability to follow complex instructions in an accurate manner and (3) psychomotor functioning.

The Chapin Social Insight Test was used to measure an individual's interpersonal perception -- to assess his ability to appraise others, to sense what they feel and think, and to predict what they may say and do. The test was used to measure interpersonal perception for blocking individuals into groups of high and low interpersonal perception.

Group Task Preparation

Standard problem-solving tasks as designed by Shaw (1963) and Hackman (1966) were used for this study. Each of these tasks required the production of a coherent verbal message. The tasks were further constrained in terms of two dimensions derived by Shaw (1963) and used by Hackman (1966):

1. Intellective rather than manipulative requirements. Tasks requiring "reasoning" or "thinking" activities were included: tasks requiring primarily motor activities were excluded.

2. High solution multiplicity. Only tasks with more than one acceptable or "correct" solution were included.

Forty-two students, the entire student body from two basic studies college classes, sorted tasks randomly presented from Shaw and Hackman according to criteria presented into factual or social problems. Subjects sorted tasks as "factual problem solving," "social problem solving," and "problem solving type not clearly factual or social." Tasks were selected from those on which subjects doing the sorting were in complete agreement. Forty-two of the forty-two students sorted one task as "factual," and it was used as the factual problem solving task. Forty-two of the forty-two students sorted two tasks as "social." Three graduate students in psychology with the experimenter selected the "social" task to be used from the two tasks selected by all forty-two students as "social." Criterion for selection was the generalizability of the task to real life problem solving.

Operational Definitions

Cognitive Abstractness

Cognitive abstractness was defined as the score of an idividual on The Test of Perceptual Organization (also known as the Abstract Reasoning Test). Individuals scoring in the top 25 percent of all subjects completing the test were classified as high in cognitive abstractness. Individuals scoring in the bottom 25 percent of all subjects completing the test were classified as low in cognitive abstractness.

Interpersonal Perception

Interpersonal perception was defined as the score of an individual on the Chapin Social Insight Test. Individuals scoring in the top 25 percent of all subjects completing the test were classified as high in interpersonal perception. Individuals scoring in the bottom 25 percent

of all subjects completing the test were classified as low in cognitive abstractness.

Factual Problem

Factual problem was defined as a task classified by complete agreement of independent judges as a task requiring subjects to work with objective, impersonal information. Factual problem solving does not require inferences and judgments about the internal states or motives of persons.

Social Problem

Social problem was defined as a task classified by complete agreement of independent judges as a task requiring subjects to make inferences and judgments about the internal states, feelings and motives of persons.

Subjects

(1) At the beginning of the term, eighteen college classes from Kearney State College from the disciplines of business, mathematics, literature, psychology, education, home economics, and speech were chosen at random and permission was obtained from faculty members to use classes for two full class periods, one period to administer the test of Perceptual Organization and the Social Insight Test and a second period to have groups of students work on two problem solving tasks, one factual and one social.

(2) In the first class session, the Test of Perceptual Organization and the Social Insight Test were administered in random order to a total of 339 students. Tests were scored and the top and bottom 25 percent were noted for each test. (The percentile range for both tests agreed

almost entirely with standard percentile scores accompanying tests.)

(3) Twenty-five students were randomly chosen from students scoring in each of the appropriate combinations: high cognitive abstractness, high interpersonal perception; high cognitive abstractness, low interpersonal perception; low cognitive abstractness, high interpersonal perception; and low cognitive abstractness, low interpersonal perception. Students in each category were numbered, and a table of random numbers was used to select five groups of five from each of the four main groups.

Collection of Data

(1) The experimental groups were randomly assigned to factual problem solving or social problem solving tasks. The tasks were alternated and groups got them on a random basis. After each group was finished with the first task they continued with the second. Each group completed one factual problem solving task and one social problem solving task.

(2) In addition to these subjects chosen to be used experimentally in groups of five, all subjects originally tested were used in groups of five to complete factual and social problem solving tasks. This was done to screen the fact that some groups were of special interest to the experimenter.

(3) Instructions were given to each group via written directions (to insure all were given the same instructions) which were also read aloud to them by the experimenter. Groups were instructed to begin work on the task. Groups indicated when they were finished and time was recorded. When each group had finished its first task it was assigned the second task.

(4) After all testing was completed subjects were told generally of the experimental plan, and they were thanked for their cooperation.

(5) From the twenty groups (five groups in each cell category) there were forty products. These products were assigned random indentification numbers and typed and duplicated onto 5 x 8 cards. The typist reproduced the notes verbatim, preserving the spelling or grammatical errors.

(6) The rating procedures for adequacy as discussed by Hackman (1968) and adapted from Shaw (1963) were used.

Numerical scores, ranging from one to seven, for each of the forty group products were obtained. Five faculty members, from the areas of business, mathematics, home economics, English and speech, were used as judges.

Judges sorted the products into seven categories, ranging from "very adequate" to "very inadequate." Agreement among judges in overall judging was $r_k = .957$ and $r_1 = .817$. With factual problem solving $r_k = .965$ and $r_1 = .849$. With social problem solving $r_k = .950$ and $r_1 = .793$.

Products were given to the judges in random order. Training procedures were employed to minimize differences in interpretations of the scale among judges. For each product, judges read a 5 x 8 card containing the task and a corresponding card containing a group product from that task. He then rated the adequacy on a seven-point scale.

Data Analysis and Design

The F ratio with Alpha at .05 was used with a three-factor mixed design with repeated measures on one factor. The three-factor mixed design is basically a combining of the factorial design and the treatments-by-subjects design.

Factor A in this study indicated the abstractness level as measured by the Test of Perceptual Organization. Factor B indicated the interpersonal perception level as measured by the Social Insight Test. Factor C represents two problem solving trials. A separate analysis of variance was completed for each of the two dependent measures of time and adequacy.

Group Results on Measure of Time

Results of Hypotheses Testing. The testing of the hypotheses at the α = .05 level of significance with the analysis of variance produced the following results for the measure of time:

Hypothesis 1. There was a significant difference among the groups on the abstractness factor when measuring time consumed. The hypothesis which predicted a significant difference among the groups on abstractness when measuring time consumed was supported. The F ratio of 11.4 was significant at the .005 level.

Hypothesis 2. There was a significant difference among groups on the interpersonal perception factor when measuring time consumed. The hypothesis which predicted a significant difference among the groups on interpersonal perception when measuring time consumed was supported. The F ratio of 32.50 was significant at the .001 level.

Hypothesis 3. There was a significant difference among the groups on the problem solving factor when measuring time consumed. The hypothesis which predicted no significant difference among the groups on problem solving when measuring time consumed was not supported. The F ratio of 42.22 was significant at the .001 level.

Hypothesis 4. There was no significant abstractness x interpersonal perception interaction among groups when measuring time consumed. The hypothesis which predicted no significant abstractness factor x interpersonal perception factor interaction among groups when measuring time consumed was supported. The F ratio of .25 was not significant at the .05 level.

Hypothesis 5. There was a significant abstractness x problem solving interaction among groups when measuring time consumed. The hypothesis which predicted a significant abstractness factor x problem solving factor interaction among groups when measuring time consumed was supported. The F ratio of 6.11 was significant at the .05 level.

Hypothesis 6. There was a significant interpersonal perception x problem solving interaction among groups when measuring time consumed. The hypothesis which predicted a significant interpersonal perception factor x problem solving interaction among groups when measuring time consumed was supported. The F ratio of 12.3 was significant at the .005 level.

Hypothesis 7. There was no significant abstractness x interpersonal perception x problem solving interaction among groups when measuring time consumed. The hypothesis which predicted no significant abstractness factor x interpersonal perception factor x problem solving interaction among groups when measuring time consumed was supported. The F ratio of .40 was not significant at the .05 level.

Table 1

Time for Problem Solving

ABC Summary Table

		Groups	Problem Solving c_1		Problem Solving c_2		Total
a_1	b_1	1	8	$\bar{X}_{111} = 7$	9	$\bar{X}_{112} = 8.0$	17
		2	7		7		14
		3	8		8		16
		4	7		9		16
		5	5		7		12
	b_2	6	8	$\bar{X}_{121} = 9.2$	12	$\bar{X}_{122} = 15.2$	20
		7	7		13		20
		8	8		22		30
		9	12		13		25
		10	11		16		27
a_2	b_1	11	7	$\bar{X}_{211} = 8.0$	17	$\bar{X}_{212} = 12.2$	24
		12	6		8		14
		13	7		10		17
		14	10		9		19
		15	10		17		27
	b_2	16	12	$\bar{X}_{221} = 10.0$	25	$\bar{X}_{222} = 21.4$	37
		17	9		21		30
		18	9		18		27
		19	8		25		33
		20	12		18		30
		Total		34.2		56.8	

A = Abstractness
1 = low
2 = high

B = Interpersonal
1 = low
2 = high

C = Problem Type
1 = social
2 = factual

Table 2

Analysis of Variance

Time for Solutions

Source	SS	df	ms	F	p
Between Subjects	490.87	19	--	--	--
High/Low Abstractness	93.02	1	93.02	11.4	.005
High/Low IP	265.22	1	265.22	32.50	.001
Abstractness X IP	2.02	1	2.02	.25	n.s.
Error between	130.61	16	8.16	--	--
Within Subjects	582.50	20	--	--	--
Social/Factual Problem Solving	319.22	1	319.22	42.22	.001
Problem Solving X Abstractness	46.22	1	46.22	6.11	.05
Problem Solving X IP	93.02	1	93.02	12.3	.005
Problem Solving X Abstractness X IP	3.03	1	3.03	.40	n.s.
Error within	121.02	16	7.56	--	--

Analysis of Results of Hypothesis Testing. Tukey's Multiple Comparison Test was used to analyze the data more specifically. Results of the contrasts are shown in Table 3.

Table 3

Time

Tukey's Multiple Comparison Test

Comparison	Confidence Intervals (Alpha level of .05)
Abstractness x Problem Solving	
Low Ab vs High Ab on Social Problem Solving	(-11.76, 8.16)
Low Ab vs High Ab on Factual Problem Solving	(-20.36, -.44)*
Social vs Factual P.S. with Low Ab	(-16.96, 9.96)
Social vs Factual P.S. with High Ab	(-25.56,-5.64)*
Interpersonal Perception x Problem Solving	
Low IP vs High IP on Social Problem Solving	(-14.16, 5.76)
Low IP vs High IP on Factual Problem Solving	(-26.36,-6.44)*
Social vs Factual with Low IP	(-14.96, 4.96)
Social vs Factual with High IP	(-27.36,-7.44)*

*Significant at the .05 level

Summary. The following significant mean differences among the groups were indicated with the analysis of variance on the measure of time:

1. There were three significant main effects on the measure of time: the abstractness factor on the measure of time; the interpersonal perception factor on the measure of time; and the problem solving factor on the measure of time. All of these three significant main effects were accompanied by significant interaction; and, therefore they were not considered for analysis.

2. There was a significant abstractness factor x problem solving factor interaction on the measure of time. This interaction was analyzed with Tukey's Multiple Comparison Test. After analyzing the data concerning time, it is concluded that it took the highly abstract groups significantly more time than the low abstract groups in completing factual problem solving. Factual problem solving required significantly more time than social problem solving for high abstract groups.

3. There was a significant interpersonal perception factor x problem solving factor interaction on the measure of time. This interaction was analyzed with Tukey's Multiple Comparison Test. It took the high interpersonal perception groups significantly more time than the low interpersonal perception groups in completing factual problem solving. Factual problem solving required significantly more time than social problem solving for high interpersonal perception groups. There was no significant difference between high and low abstract groups with social problem solving, and, similarly, there was no significant difference in time consumed between high and low interpersonal perception groups with social problem solving.

Group Results on the Measure of Adequacy

Results of Hypotheses Testing. The testing of the hypotheses at the $\alpha = .05$ level of significance on the measure of adequacy with the analysis of variance produced the following results:

Hypothesis 8. The hypothesis which predicted a significant difference among the groups on abstractness when measuring judged adequacy was supported. There was a significant difference among the groups on the abstractness factor when measuring judged adequacy. The F ratio of 151.9 was significant at the .001 level.

Hypothesis 9. The hypothesis which predicted a significant difference among the groups on interpersonal perception when measuring judged adequacy was supported. There was a significant difference among the groups on the interpersonal perception factor when measuring judged adequacy. The F ratio of 146.14 was significant at the .001 level.

Hypothesis 10. The hypothesis which predicted no significant difference among the groups on problem solving when measuring judged adequacy was supported. There was no significant difference among the groups on the problem solving factor when measuring judged adequacy. The F ratio was not significant at the .05 level.

Hypothesis 11. The hypothesis which predicted a significant abstractness factor x interpersonal perception factor interaction among groups when measuring judged adequacy was not supported. There was no significant abstractness x interpersonal perception interaction among groups when measuring judged adequacy. The F ratio of 3.85 was not significant at the .05 level.

Hypothesis 12. The hypothesis which predicted a significant abstractness factor x problem solving factor interaction among groups when measuring judged adequacy was supported. There was a significant abstractness x problem solving interaction among groups when measuring judged adequacy. The F ratio of 44.89 was significant at the .001 level.

Hypothesis 13. The hypothesis which predicted a significant interpersonal perception factor x problem solving factor interaction among groups when measuring judged adequacy was supported. There was a significant interpersonal perception x problem solving interaction among groups when measuring judged adequacy. The F ratio of 41.06 was significant at the .001 level.

Hypothesis 14. The hypothesis which predicted no significant abstractness factor x interpersonal perception factor x interaction among groups when measuring judged adequacy was not supported. There was no abstractness x interpersonal perception x problem solving interaction when measuring judged adequacy. The F ratio of 2.78 was not significant at the .05 level.

Table 4

Adequacy of Problem Solving

ABC Summary Table

		Groups	c_1		c_2		Total
a_1	b_1	1	1.2		1.4		2.6
		2	1.6		1.2		2.8
		3	2.0	$\bar{X}_{111} = 1.72$	1.0	$\bar{X}_{112} = 1.34$	3.0
		4	1.8		2.0		3.8
		5	2.0		1.1		3.1
	b_2	6	4.8		3.6		8.4
		7	4.4		2.4		6.8
		8	5.0	$\bar{X}_{121} = 5.00$	2.8	$\bar{X}_{122} = 3.00$	7.8
		9	6.0		2.4		8.4
		10	4.8		3.8		8.6
a_2	b_1	11	2.6		5.4		8.0
		12	3.6		5.0		8.6
		13	2.0	$\bar{X}_{211} = 2.80$	4.8	$\bar{X}_{212} = 5.28$	6.8
		14	2.4		5.0		7.4
		15	3.4		6.2		9.6
	b_2	16	6.8		5.8		12.6
		17	5.0		5.8		10.8
		18	6.0	$\bar{X}_{221} = 5.96$	6.0	$\bar{X}_{222} = 5.68$	12.0
		19	5.6		5.4		11.0
		20	6.4		5.4		11.8
		Total		15.48		15.30	

A = Abstractness
1 = low
2 = high

B = Interpersonal
1 = low
2 = high

C = Problem Type
1 = social
2 = factual

Table 5

Analysis of Variance

Adequacy of Solutions

Source	SS	df	ms	F	p
Between Subjects	98.156	19	--	--	--
High/Low Abstractness	46.872	1	46.872	151.69	.001
High/Low IP	45.156	1	45.156	146.14	.001
Abstractness X IP	1.190	1	1.190	3.85	n.s.
Error between	4.938	16	.309	--	--
Within Subjects	30.604	20	--	--	--
Social/Factual Problem Solving	0.020	1	.02	--	n.s.
Problem Solving X Abstractness	13.110	1	13.11	44.89	.001
Problem Solving X IP	11.990	1	11.99	41.06	.001
Problem Solving X Abstractness X IP	0.812	1	.812	2.78	n.s.
Error within	4.672	16	.292	--	--

Analysis of Results of Hypothesis Testing. The results were analyzed on the dependent measure of adequacy with Tukey's Multiple Comparison Test. The results of the contrasts are shown in Table 6.

Table 6

Adequacy

Tukey's Multiple Comparison Test

Comparison	Confidence Intervals (Alpha level of .05)
Abstractness x Problem Solving	
Low Ab vs. High Ab on Social Problem Solving	(-3.99, - .08)*
Low Ab vs. High Ab on Factual Problem Solving	(-8.57, -4.66)*
Social vs. Factual Problem Solving with Low Ab	(.43, 4.33)*
Social vs. Factual Problem Solving with High Ab	(-4.15, - .25)*
Interpersonal Perception x Problem Solving	
Low IP vs. High IP on Social Problem Solving	(-8.39, -4.49)*
Low IP vs. High IP on Factual Problem Solving	(-5.01, -1.11)*
Social vs. Factual Problem Solving with Low IP	(-4.05, - .15)*
Social vs. Factual Problem Solving with High IP	(.33, 4.23)*

*Significant at the .05 level

Summary. In summary, the following significant mean differences among the groups were indicated with the analysis of variance on the measure of adequacy.

1. There were two significant main effects on the measure of adequacy: the abstractness factor on the measure of adequacy, and the interpersonal perception factor on the measure of adequacy. Both of these two significant main effects were accompanied by significant interaction; and, therefore, they were not considered for analysis.

2. There was a significant abstractness x problem solving interaction on the measure of adequacy. This interaction was analyzed with Tukey's Multiple Comparison Test. The data concerning the adequacy of the problem solving of various groups shows that there was a significant difference in adequacy between the low and high abstract groups on social problem solving. There was a significant difference in adequacy between the low and high abstract groups on factual problem solving. The highly abstract groups produced solutions which were significantly more adequate for both social and factual problem solving than were the solutions produced by the groups low in abstractness.

The low abstract groups produced significantly more adequate solutions with social problem solving as contrasted with factual problem solving. The high abstract groups produced significantly more adequate solutions with factual problem solving as contrasted with social problem solving.

3. There was a significant interpersonal perception x problem solving interaction on the measure of adequacy. This interaction was analyzed with Tukey's Multiple Comparison Test.

The data shows that there was a significant difference in adequacy between the high and low interpersonal perception groups on social and factual problem solving. The groups with high interpersonal perception produced solutions to social and factual problems which were significantly more adequate than the soltuions produced by groups low in interpersonal perception.

The low interpersonal perception groups produced more adequate solutions on factual problem solving as contrasted with social problem solving. The high interpersonal perception groups produced significantly more adequate solutions with social problem solving as contrasted with factual problem solving.

Discussion

Results of Hypotheses Testing

Time. On the measure of time there were three significant main effects: abstractness, interpersonal perception, and problem solving. These three main effects, however, were accompanied by significant interaction, and will be discussed as interactions.

There were four possible interactions in the study on the measure of time. Each of these possible interactions will be discussed. It will be indicated whether or not the interaction was significant on the measure of time, and the results will be interpreted.

There was no significant interaction between the abstractness levels of groups and the interpersonal perception levels of groups when measuring time consumed. In other words, it made no significant difference in time consumed if high or low abstractness were combined with high or low interpersonal perception.

Time for problem solving was affected by abstractness level and problem solving interaction. The high abstract groups took significantly more time than the low abstract groups with factual problem solving. This may have been the result of the high abstract groups testing more alternatives for the facutal problems as indicated by Bourne (1966), Tuckman (1964) and Pavio (1971).

There was no significant difference in time consumed between the high and low abstract groups with social problem solving tasks. Although the high abstract groups may have seen more alternatives to the factual problem solving, they would not necessarily see as many solutions to social problem solving. Social problem solving calls for more investment of self (Pages, 1965 and Katz, 1963). Social problem solving calls for judgments based on social insight. There may not be a significant difference between high and low abstract groups when making these interpersonal decisions.

The time for problem solving was significantly affected by the interaction between the interpersonal perception level and the problem solving task. The groups high in interpersonal perception consumed significantly more time than groups low in interpersonal perception when completing the factual task. On the other hand, there was no significant difference in time consumed by the high and low interpersonal perception groups on social tasks. It took significantly more time for factual problem solving as contrasted to social problem solving for high interpersonal perception groups. There was no significant difference between the time consumed for social and factual problem solving with low interpersonal perception groups. Libby (1971) indicated that individuals high in interpersonal perception can be expected to interact more than groups low in

interpersonal perception. Perhaps the factual problem solving was more difficult than the social task for the high interpersonal perception groups and presented the need for more interaction. The high interpersonal perception group members with high interpersonal perception may have interacted more than low interpersonal perception groups. As a result, it took the high interpersonal perception members longer with factual problem solving. These same high interpersonal perception groups may have found the social problem solving less difficult for them, and as a result, they did not spend so much time in interaction. The low interpersonal perception groups perhaps interacted less generally on problem solving as would be expected, with the task making no significant difference on the amount of interaction for these groups.

The various combinations of high and low abstract groups with high and low interpersonal perception groups with the two problem solving tasks produced no significant three-way interactions on the measure of time consumed. None was expected.

Adequacy. There were two main effects on the measure of adequacy: abstractness and interpersonal perception. Both of these main effects were accompanied with significant interactions, and they will be discussed as interactions.

The adequacy of solutions was not significantly affected by the problem solving task. It made no significant difference whether the task was social or factual on the measure of adequacy. The ratings of solutions for the social and factual tasks did not differ significantly on adequacy. This should add validity to the study, as the judges rating

of tasks, then, on the measure of adequacy would indicate a difference in the performance of groups rather than a difference in adequacy as a result of problem solving type.

The various combinations of high and low abstract groups with high and low interpersonal perception groups made no significant difference when measuring adequacy of solutions, although the high abstract, high interpersonal perception groups did have the highest performance of any other combinations on the social and facutal tasks.

As noted in the review of literature, Chapin (1939) believed that there are problems necessitating abstract mental processes and others requiring a type of social intelligence. This could explain the significant interactions on the measure of adequacy which were evident between the abstractness levels of groups and the problem solving types and between the interpersonal perception levels and the problem solving types.

There was a significant interaction between abstractness and problem solving on the measure of adequacy. Various combinations of the abstractness level of group members with the two task types produced significant differences in the adequacy of the solutions produced. Groups of high abstractness produced significantly more adequate solutions on the facutal problem solving as contrasted to the social problem solving. Groups of low abstractness had solutions judged to be significantly more adequate for social problem solving as contrasted to their performance with factual problem solving. Groups of low abstractness had solutions judged to be significantly more adequate for social problem solving as contrasted to their performance with factual problem solving.

If the factual problem solving required more complex abstract functioning and the social problem solving required solutions based on insight into social problems as was indicated in the review of literature (Vannoy, 1963; Streufert and Driver, 1967; Morris, 1966), it would be expected that the groups high in abstractness would perform best on the problems requiring their specific qualities of abstract functioning. Groups low in abstractness might be expected to perform more adequately on those tasks not specifically requiring an abstract orientation.

There was a significant interaction between interpersonal perception and problem solving on the measure of adequacy. Various combinations of the interpersonal perception level of group members in combination with the two task types produced significant differences in the adequacy of the solutions produced. Groups high in interpersonal perception produced solutions which were significantly more adequate than the solutions from groups low in interpersonal perception on both social and factual problem solving, with high interpersonal perception groups having their best performance with social problem solving. Groups high in interpersonal perception produced significantly more adequate solutions for the social problem solving as contrasted to the factual problem solving. On the other hand, groups low in interpersonal perception produced solutions which were significantly more adequate for factual problem solving as contrasted to social problem solving.

As noted in the review of literature, the high interpersonal perception groups could probably analyze the social problem more effectively and produce a more adequate solution than low interpersonal perception groups. The high interpersonal perception groups probably interacted more

effectively than the low interpersonal perception groups (Libby, 1971), and therefore performed significantly better than the low interpersonal perception groups on both social and factual problem solving, although their best performance was with social problem solving. The groups low in interpersonal perception were able to produce significantly more adequate solutions for the factual problem than they were for the social problem, as they may have lacked the social insight to see the more adequate solutions for the social problem.

The various combinations of high and low abstract groups with high and low interpersonal perception groups with the two problem solving tasks produced no significant three-way interactions on the measure of adequacy.

In summary, adequacy for problem solving was significantly affected by the interaction between the abstractness of group members and the problem solving task and by the interpersonal perception of group members and the problem solving task. Major conclusions will now be presented.

Major Conclusions

The following major conclusions can now be stated as a result of the study.

1. Groups high in abstractness took significantly more time than groups low in abstractness when working with factual tasks. There was no significant difference in time consumed between groups with high and low abstractness on the social task.

2. Groups with high interpersonal perception took significantly more time than groups with low interpersonal perception when working with factual tasks. There was no significant difference in time consumed between groups with high and low interpersonal perception when working with social tasks.

3. High abstract groups took significantly more time with factual problem solving than with social problem solving.

4. High interpersonal perception groups took significantly more time with factual problem solving than with social problem solving.

5. The highly abstract groups had significantly more adequate solutions than the low abstract groups for both factual and social problem solving, but the more adequate solutions were produced by the highly abstract groups with factual problem solving.

6. The low abstract groups had significantly more adequate solutions with the social problem solving than they did with factual problem solving.

7. The high abstract groups had significantly more adequate solutions with factual problem solving than they did with social problem solving.

8. The high interpersonal perception groups had significantly more adequate solutions than the low interpersonal perception groups for both factual and social problem solving, but the high interpersonal perception groups did their best on social problem solving.

9. The low interpersonal perception groups had significantly more adequate solutions with the factual problem solving than they did with social problem solving.

Possibilities of Matching Task Type and Group Composition

It appears that it may be possible to match groups on the basis of cognitive abstractness and interpersonal perception ability to factual or social tasks for efficiency of time consumed and adequacy of problem solving. Those groups high in cognitive abstractness and interpersonal

perception appear to perform in a more adequate manner with both social and factual problem solving; but those groups high in cognitive abstractness perform better with factual problem solving than with social problem solving, and groups high in interpersonal perception perform better with social problem solving than with factual problem solving. Therefore, it seems reasonable to assume that groups high in cognitive abstractness and interpersonal perception could produce adequate solutions for both factual and social problem solving. However, if a group high in cognitive abstractness were low in interpersonal perception, they could produce adequate solutions for factual problem solving; and groups low in cognitive abstractness and high in interpersonal perception could produce adequate solutions for social problem solving.

Groups high in cognitive abstractness, whether low or high in interpersonal perception, should be able to produce adequate solutions for factual tasks. Examples of factual problem solving for groups might include tasks as those encountered by groups designing retrieval systems, groups designing traffic patterns and controls, groups serving jury duty to determine cases on the basis of facts presented, groups solving problems generally requiring the combining and restructuring of complex information.

Groups high in interpersonal perception whether low or high in cognitive abstractness, should be able to produce adequate solutions for social tasks. Such task groups might include groups working with human relations problems, personnel management, collective bargaining, sales, political campaigns, advertising, welfare programs, minority relations, teaching teams and international negotiations.

As the result of this study, when considering time consumed, groups high in abstractness and/or high in interpersonal perception could be expected to take more time with the factual task than with the social task. The high interpersonal perception groups took more time with the factual than with the social task, but they had more adequate solutions for the social task than for the factual task, so it seems that the interpersonal perception groups would be most efficient in the use of time with the social tasks. On the other hand, the groups high in cognitive abstractness took more time with the factual than with the social tasks, but they had more adequate solutions for the factual task than for the social; so although it took the groups high in cognitive abstractness more time with the factual task, the adequacy of the performance may have been worth the additional time consumed.

Suggestions for Future Studies

In future studies, it might be well to vary the difficulty of the task on several levels, as several levels of factual problem solving, to see if the highly abstract and high interpersonal perception groups perform better on all levels of the factual and social tasks or only on the moderate to high difficulty level.

In future studies, it might be well to analyze interaction in the groups to see if levels of abstractness and interpersonal perception affect the procedures used for completing tasks.

Finally, it might be well to measure other characteristics of individuals and block them into groups to determine if these characteristics, as well, affect group performance.

BIBLIOGRAPHY

Altman, Irwin. "Aspects of the Criterion Problem in Small Group Research." Acta Psychologica, 25 (1966), 101-131.

Chapin, F. Stuart. "Preliminary Standardization of a Social Insight Scale." American Sociological Review, 7 (1942), 214-225.

Chapin, F. Stuart. "Social Participation and Social Intelligence." American Sociological Review, 4 (1939), 157-166.

Chapman, James Lee. Development and Validation of a Scale to Measure Empathy. East Lansing: Michigan State University, 1966.

Cronbach, Lee J. "Processes Affecting Scores on 'Understanding of Others' and 'Assumed Similarity'." Psychological Bulletin, 52 (1955).

Dymond, Rosalind. "A Scale for the Measurement of Empathic Ability." Journal of Consulting Psychology, 13 (1949), 127-133.

Fiedler, Fred E. "Interpersonal Perception and Group Effectiveness." Person Perception and Interpersonal Behavior. Stanford: Stanford University Press, 1965.

Fisher, B. Aubrey. Small Group Decision Making: Communication and the Group Process. New York: Mc-Graw Hill Book Company, 1974.

Gage, N. L. "Accuracy of Social Perception and Effectiveness in Interpersonal Relationships." Journal of Personality, 22 (1953), 128-141.

Gage, N. L. and Lee J. Cronbach. "Conceptual and Methodological Problems in Interpersonal Perception." Psychological Review, 62 (1955), 411-422.

Gompertz, Kenneth. "The Relation of Empathy to Effective Communication." Journalism Quarterly, 37 (1960), 533-546.

Gough, Harrison G. "A Validational Study of the Chapin Social Insight Test." Psychological Reports, 17 (1965), 355-368.

Hackman, J. R. "Effects of Task Characteristics on Group Products." Journal of Experimental Social Psychology, 4 (1968), 162-187.

Hackman, J. R. "Toward Understanding the Role of Tasks in Behavioral Research." Acta Psychologica, 39 (1969), 97-128.

Harris, Richard J. "An Interval-Scale Classification System for All 2x2 Games." Behavioral Science, 17 (1972), 371-383.

Harvey, O. J., David E. Hunt, and Harold M. Schroder. Conceptual Systems and Personality Organization. New York: John Wiley and Sons, Inc., 1961.

Hastorf, A. H. and I. E. Bender. "A Caution Respecting the Measurement of Empathic Ability." Journal of Abnormal and Social Psychology, 48 (1952), 574-576.

Haythorn, W. W. "The Influence of Individual Members on the Characteristics of Small Groups." Journal of Abnormal and Social Psychology, 48 (1953), 276-284.

Haythorn, W. W., A. Couch, D. Haefner, P. Longham, and L. F. Carter. "The Effects of Authoritarian and Equalitarian Personalities in Groups." Human Relations, 9 (1956), 57-74.

Hobart, Charles W. and Nancy Fahlberg. "The Measurement of Empathy." American Journal of Sociology, 70 (1965), 595-603.

Jawa, Sarala. "Creativity and Orientation Type." Psychology Annual, 4 (1970), 45-48.

Josephson, Barry L. "Comparison of Behaviors of Pre-Adolescent Children in Task and Person Oriented Groups Examined from Transactional and Symbol Interaction Perspectives." Unpublished Dissertation, 1972.

Katz, Robert L. Empathy. London: The Free Press of Glencoe, 1963.

Laing, R. D., H. Phillipson, and A. R. Lee. Interpersonal Perception. New York: Springer Publishing Company, 1966.

Lawrence, E. A. "An Investigation of Some Relationships Between Personality Structure and Group Functioning." Unpublished Senior Thesis. Princeton University, 1962.

Libby, William L. "Sociometric Task Leadership and the Perception of Deviance and Subsequent Conformity as Functions of Personality." Genetic Psychology Monographs, 84 (1971), 245-273.

Martin, William T. "Analysis of the Abstracting Function in Reasoning Using an Experimental Test." Psychological Reports, 21 (1967), 593-598.

McGrath, Joseph E. and M. F. McGrath. "Effects of Partisanship on Perceptions of Political Figures." Public Opinion Quarterly, 26, 236-248.

Mead, George H. Mind, Self, and Society. Chicago: University of Chicago Press, 1934.

Morris, Charles G. "Tasks Effects on Group Interaction." Journal of Personality and Social Psychology, 4 (1966), 545-554.

Pages, R. "La Perception D'autrui." Traite de Psychologie Experimentale. Paris: Presses Universitaires de France, (1965), 101-169.

Paivio, Allan. Imagery and Verbal Processes. New York: Holt, Rinehart and Winston, Inc., 1971.

Pervin, L. A. "Performance and Satisfaction as a Function of Individual-Environment Fit." Psychological Bulletin, 69 (1965), 56-68.

Phillips, Gerald M. Communication and the Small Group. New York: Bobbs-Merill Company, Inc., 1966.

Roby, Thornton B. and John T. Lanzetta. "Considerations in the Analysis of Group Tasks." Psychological Bulletin, 55 (1958).

Schroder, Harold M., Michael J. Driver, and Siegfried Streufert. Human Information Processing. New York: Holt, Rinehart and Winston, 1967.

Schutz, William C. "On Group Composition." Journal of Abnormal and Social Psychology, 62 (1961), 275-281.

Shaw, Marvin E. Scaling Group Tasks: A Method for Dimensional Analysis. Technical Report No. 1, ONR Contract NR 170-266, Nonr-580 (1), University of Florida, 1963.

Streufert, Siegfried and Michael J. Driver. "Impression Formation as a Measure of the Complexity of Conceptual Structure." Educational and Psychological Measurement, 27 (1967), 1025-1039.

Tagiuri, Renato and Luigi Petrullo. Person Perception and Interpersonal Behavior. Stanford: Stanford University Press, 1965.

Toch, Hans and Henry Clay Smith, eds. Social Perception. Princeton: D. Van Nostrand Company, Inc., 1968.

Tuckman, Bruce. "Group Composition and Group Performance of Structured and Unstructured Tasks." Journal of Experimental Social Psychology, 3 (1967), 25-40.

Tuckman, Bruce. "Personality Structure, Group Composition, and Group Functioning." Sociometry, 27 (1964), 469-487.

Vannoy, Joseph S. "The Generality of Cognitive Complexity-Simplicity as a Personality Construct." Journal of Personality and Social Psychology, 2 (1963), 385-396.